APPENDIX FS-E

Soil and Soil Vapor Sampling Protocols and QAPP

LFR FIELD PROTOCOLS FOR SOIL SAMPLING AND CONTINUOUS CORING AND QAPP

FIELD PROTOCOLS

Pre-Sampling Activities

A site-specific Health and Safety Plan (HSP) will be prepared for the sampling activities. All LFR employees at the Site, as well as subcontractors and regulatory personnel, will be required to read and sign the HSP in order to familiarize themselves with the safety procedures and protocols to be maintained while performing work at the Site. A copy of the HSP will be available on-site during field activities for reference and review by regulatory or site personnel.

All proposed sampling locations will be marked as required by Underground Service Alert (USA). LFR will contact USA at least three days before commencement of the field work to obtain a utility clearance ticket number. LFR will also subcontract with a subsurface utility locator to screen the proposed sampling locations. In addition, sample locations will be surveyed by a licensed surveyor.

Drilling of Soil Borings and Collection of Soil Samples for TPH, PCBs, SVOCs, PAHs, VOCs, Metals, Pesticides, and Dioxin Analysis and Soil Vapor Samples for VOC Analysis.

Collection of soil samples at the Site will be performed using one of two methods:

- **Hand-auger** – A 3- to 4-inch-diameter hand auger

- **Rig-mounted Geoprobe drill -** A Geoprobe drill with a 1-inch diameter hollow tube and 4-foot acetate sleeves fitted into the hollow tube

A detailed description of the field protocols for the drilling of soil borings and the collection of soil samples for both methods is presented below.

Soil borings will be drilled using a 3- to 4-inch-diameter hand auger. The auger will be cleaned prior to use at each borehole location. The auger will be advanced to the desired sample interval and removed.

A core-barrel sampler will be used to collect the sample at the required interval. The core-barrel sampler will be lined with clean stainless steel sleeves fitted into the end of the sampler. The sampler will be driven into the soils to obtain relatively undisturbed soil samples.

Immediately upon collection of the sample, the soil-filled sampling tube will be removed from the sampling tool and the ends of the tube will be capped with Teflon sheets, plastic end caps, and silicon-based tape. Following collection, the samples will be labeled, placed in zip lock baggies, and then placed in a light-occlusive thermostatically controlled preservation device (i.e., a cooler containing ice) until they are transferred to the analytical laboratory. The cooler will be kept at a temperature of 4 degrees Celsius (plus or minus 2 degrees Celsius). To reduce the potential for cross contamination between borings, hand auger and sampling equipment will be cleaned prior to use at each drilling location. Strict chain-of-custody protocol will be followed throughout all phases of the sample handling process.

Sample container labels will include a unique sample identification number, the name of the person collecting the sample, the time the sample was collected, project identification, sample location, analytical parameters, date sampled, and any preservative added to the sample.

LFR Soil Sample Collection Procedures for VOCs Using EPA Method 5035

Discrete soil samples collected for VOC analysis will be obtained using EPA Method 5035. Soil samples can be preserved in the field or by the laboratory. Discrete soil samples for VOC analysis will be collected assuming that the concentrations are unknown. Soil samples will be obtained by either collecting soil from a sampling sleeve using a syringe, or by thrusting the En Core™ sampler into the soil until it is full. Descriptions of the syringe method and En Core™ sampler method are provided below.

If soil samples are collected from a syringe, they will be preserved in the field. For soil samples preserved in the field, each soil sample will consist of two subsamples (soil collected with a clean syringe and extracted into laboratory-provided vials that contain preweighed amounts of methanol or sodium bisulfate). If soil samples are preserved in the laboratory, each soil sample will consist of either two clean 5-gram En Core™ samplers or one clean 25-gram En Core™ sampler.

The sample containers will be placed in a sealable plastic bag in a portable cooler. The samples will be placed immediately on ice and will be kept cooled and on ice or in a refrigerator until transport to the laboratory (at 4°C ±2°C). Sample collection, handling, and custody procedures will be documented in the field logbook. Soil sample collection requirements for EPA Method 5035 are attached. Samples collected for analytical testing will be maintained under strict chain-of-custody protocol.

Procedures for Collecting Soil Samples Using the Syringe Method

Before going to the field:

1 Discuss the analytical requirements for the project with the analytical laboratory. Obtain pre-weighed clean VOAs from the laboratory. The laboratory will provide separate VOAs containing methanol and sodium bisulfate preservative.

2 Determine from the laboratory the mass of soils that should be placed in each VOA, as well as the number of VOAs to be filled in the field for the required number of analyses. The mass of soil is proscribed by the laboratory when the laboratory specifies the size of the syringe to use and the number of syringe volumes to be placed in the VOA.

In the field:

1 For each sampling depth, drive samplers containing clean sleeves into the soils at the desired depth. Evaluate the soils in the sleeve using a PID, FID or by visual evidence to select the soils that are finer grained for VOC analysis and/or have higher volatile emissions.

2 Using a new clean syringe, remove the specified mass of soils from the sleeve and inject it into the VOA. Seal the VOA and clean off any excess soil from the outside of the VOA.

3 Label the VOA with all the required sampling information and place the VOA in the chilled cooler for delivery to the laboratory.

Procedures for Collecting Soil Samples with the En Core™ Sampler

Before taking sample:

1 Hold the clean coring body and push the plunger rod down until the small o-ring rests against the tabs. This will assure that the plunger moves freely.

2 Depress the locking lever on the En Core™ T-Handle. Place the coring body, plunger end first, into the open end of the T-Handle, aligning the two slots on the coring body with the two locking pins in the T-Handle. Twist the coring body clockwise to lock the pins in the slots. Check to ensure that the sampler is locked in place. The sampler is now ready for use.

Taking sample:

1 Turn the T-Handle with the T up and the coring body down. This positions the plunger bottom flush with the bottom of the coring body (ensure that the plunger bottom is in position). Using the T-Handle, push the Sampler into soil until the coring body is completely full. When full, the small o-ring will be centered in the T-Handle viewing hole. Remove the Sampler from soil. Wipe excess soil from the coring body exterior.

2 Cap coring body while it is still on the T-handle. Push cap over the flat area of the ridge and twist to lock the cap in place. The cap must be seated to seal the sampler.

3 Clean the coring body and plunger using the triple rinse procedure.

Preparing Sampler for Shipment:

1 Remove the capped Sampler by depressing the locking lever on the T-Handle while twisting and pulling the Sampler from the T-Handle.

2 Lock the plunger by rotating the extended plunger rod fully counter-clockwise until the wings rest firmly against the tabs.

3 Attach completed circular label (from En Core™ Sampler bag) to the cap on the coring body. Label the En Core™ Sampler with all the required sampling information, and place the sampler in the chilled cooler for delivery to the analytical laboratory.

4 Return the full En Core™ Sampler to the zipper bag. Seal the bag and put it on ice.

Continuous Coring

Continuous coring will be done with a Geoprobe drill using push technology. A 1-inch diameter hollow tube will be driven into the soil and advanced to the desired depth. Soil cores will be captured in 4-foot acetate sleeves fitted into the hollow tube. Soil from the continuous cores will be visually inspected to determine lithologies. Soil will be lithologically described and classified using the USCS. A lithologic log will be prepared for each location. Drilling and logging will be performed under the direction of an LFR California Registered Geologist.

Additionally, soil from the continuous cores may be collected for chemical analyses at the discretion of the field geologist. Soil samples collected from the continuous cores will be properly sealed, labeled, and placed in a cooler chilled to 4 degrees Celsius for delivery to an analytical laboratory. Strict chain-of-custody protocol will be followed throughout all phases of the sample handling process.

Soil Gas Sampling from Temporary Soil Borings

Prior to sample collection for samples to be analyzed by EPA Method 8260B, the first five dead volumes of gas shall be discarded to flush the sample tubing and fill it with in situ soil vapor, and the appropriate purge volume will be selected in accordance with the RAP. In addition, leak tests will be conducted at each soil- vapor probe in accordance with the RAP. Isobutene (shaving cream), 1,1-difluoroethane (propellant in "Dust Off") or a similar compound that will be previously approved by the DTSC, will be used as a tracer to test for leaks to the bentonite seal. A 20-cubic-centimeter sample will then be drawn into the syringe. The syringe shall be plugged and immediately transferred to an on-site mobile lab for chemical analysis. A portable photoionization detector (PID) will be used in the field to ensure adequate venting of soil vapor during investigative activities.

The leak test compound will be analyzed along with the target analytes. A lack of the leak test compound detected in the samples will be an indication that the fittings and probe were sealed and were not conduits for ambient air to be drawn into the sampling assembly.

Sample Intervals

Soils will be sampled at the intervals specified in the RAP, or at the discretion of the geologist based on field observations such as changes in lithology, visual observations of staining or measurements of volatile emissions.

Sample Selection

In each boring, one stainless steel tube from each sampling interval will be retained for possible chemical analysis. The selection of soil samples to be submitted for chemical analysis will be based on the work plan, and may be augmented based on field observations such as VOC or total petroleum hydrocarbon (TPH) emission measurements using the flame ionization detector (FID) or photoionization detector (PID), lithology, and soil staining. The FID or PID will be calibrated prior to use. One soil sample from each sampling interval will be placed in a plastic bag, broken apart, and allowed to stand for a minimum of 5 minutes prior to screening. The concentration of emissions in the resultant "head space" gas will then be measured with the FID or PID and recorded. Lithology will be evaluated to select samples with finer grain size for VOC analysis.

Lithologic Description

Soil samples will be lithologically described and classified using the Unified Soil Classification System (USCS). A lithologic log will be prepared for each boring. Blow counts will be recorded at each sampling interval to evaluate consistency of the soils. Drilling and logging will be performed under the direction of an LFR California Registered Geologist.

Field Logbook Recordings

The LFR field technician will record sampling activities, sampling locations, site observations, and other pertinent information on field service forms. Information to be recorded in the field logbooks includes: date, starting time, site identification, meteorological conditions, sample identification numbers, location and description of sampling points, number of samples collected, time of sample collection, photo log, deviations from work plan, field personnel protection, level of personnel protection, field observations and parameters, problems encountered and actions taken to resolve problems, and the signature of the person making the entry. Information will be recorded in permanent ink. If an error is made, corrections must be made by crossing a line through the error and entering the correct information. Changes will be initialed.

Boring Logs

Soil lithology will be logged by an experienced field geologist under the supervision of a California Registered Geologist. Recovered soil samples will be field screened for evidence of contamination using an organic vapor analyzer along with visual senses. Information to be recorded on the boring logs include: Registered Professional (PE or RG) responsible for the boring log (stamp, signature, license number, and expiration date), boring location (survey coordinates or identification number), surface elevation if known, outside boring diameter, total depth, depth to groundwater (during drilling and static), sample identification, interval, percent recovery in sample tubes, USCS soil classification group name and symbol, major and minor soil constituents and their relative percentages, soil color, soil moisture, odor, observations regarding the possible presence of contaminants, grain size and shape, field estimation of moisture content, field instrumentation readings, sampling intervals, and other pertinent details.

Borehole Abandonment

After samples are collected from the boring, the boring will be completely filled with clean soil and/or grout/bentonite to within 6 inches of the ground surface. The upper 6 inches of each boring will then be filled to the ground surface with clean soil and/or a cement slurry. Hand auger locations will be backfilled with bentonite chips and/or clean soil.

Decontamination Procedures

To reduce the potential for cross contamination, soil sampling equipment will be properly cleaned prior to use at each sampling location. Sampling equipment will either be steam cleaned or washed with a laboratory grade non-phosphate detergent solution and double-rinsed with deionized water. Equipment that comes into contact with potentially contaminated soil will be decontaminated consistently to assure the quality of samples collected. Disposable equipment intended for one-time use will not be decontaminated, but will be packaged for appropriate disposal. Decontamination will occur prior to and after each use of a piece of equipment.

All drilling and sampling devices used at the Site will be decontaminated using the following procedures:

- non-phosphate detergent and tap water wash, in a 5-gallon plastic bucket, using a brush
- initial deionized/distilled water rinse, in a 5-gallon plastic bucket
- final deionized/distilled water rinse, in a 5-gallon plastic bucket

Equipment will be decontaminated in a pre-designated area on plastic sheeting, and clean bulky equipment will be stored on plastic sheeting in uncontaminated areas.

Cleaned small equipment will be stored in plastic bags. Materials that will be stored more than a few hours will also be covered.

Chain-of-Custody Records

A chain-of-custody record will accompany all sample shipments. Chain-of-custody forms will be completed and sent with each shipment for each laboratory. If multiple coolers are sent to a single laboratory on a single day, a chain-of-custody form will be completed for each cooler. The chain-of-custody record will identify the contents of each shipment and maintain the custodial integrity of the samples. Generally, a sample is considered to be in someone's custody if it is either in someone's physical possession, in someone's view, locked up or kept in a secured area that is restricted to authorized personnel. Until the samples are received by the laboratory, sample custody will be the responsibility of the sample collector. Sample container labels will include a unique sample identification number, the name of the person collecting the sample, the time the sample was collected, project identification, sample location, analytical parameters, date sampled, and any preservative added to the sample.

Sample Transfers

Strict chain-of-custody protocol will be followed throughout all sample transfers. A chain-of-custody document will be completed in triplicate. One copy will accompany the samples to the laboratory, one will be retained by the sampler, and the third will be forwarded to the LFR data management system.

Field QA/QC Procedures

Field QA/QC procedures performed at the Site will consist of the following measures:

- Chain-of-custody forms will be used for sample submittal to the laboratory.

- Daily information regarding soil sample collection will be recorded in field logbooks dedicated to this project. Sample types, soil descriptions, sample identification numbers, and sample times will be collected and recorded on field data sheets and in the field logbooks. Pages will be numbered, dated, and signed by the person performing data entry.

Field QA/QC samples will be collected and submitted for analysis along with the discrete soil samples, using the following sampling frequency:

- equipment blanks – one equipment rinseate blank per field day
- field blanks – one field blank sample per field day
- field duplicates – one duplicate for every ten discrete samples
- travel blanks – one travel blank per field day for all soil samples

Equipment Rinsate Blanks

An equipment rinsate blank (equipment blank) will be collected from the final water rinsed over equipment after cleaning activities have been performed. The equipment blank will be collected from non-dedicated (reusable) sampling equipment such as soil sampling tools and sampling equipment. The equipment blank will be analyzed using the same analytical method used on the unique soil samples.

To collect an equipment blank sample, distilled water will be carefully poured over or through the recently cleaned equipment, and collected directly into an appropriated sample container held over a bucket. Equipment blank samples will be stored and processed in the same manner as all other samples.

Field Blanks

Field blank samples will consist of a sample of the distilled deionized water that was used to wash sampling equipment during equipment cleaning activities. The purpose of the field blank sample is to evaluate the water for COCs. A field blank sample will be collected by pouring distilled water into the appropriate sample container. The field blank samples will be stored and processed in the same manner as all other aqueous samples.

Field Duplicate Sample

Duplicate soil samples will be collected to evaluate the analytical procedures and methods employed by the laboratory. The field duplicate sample will be collected immediately after collecting the original soil sample. One field duplicate will be collected for every ten soil samples collected.

Travel Blanks

Travel blank samples will be utilized to determine cross contamination of COCs during travel. One travel blank per field day will be utilized for all soil samples.

Investigation-Derived Wastes

Waste soils produced during sampling activities will be contained in DOT-approved drums, labeled, and temporarily stored on site pending receipt of the analytical data and evaluation of appropriate disposal options.

The volume of investigation-derived wastes is estimated to be relatively small. All soil cuttings will be collected in a 55-gallon drum, labeled, and secured on the Site. The Office of Emergency and Remedial Response (OERR) Directive 9345.3-02 (May 1991), which provides guidance for the management of investigation-derived wastes, will be followed. Liquids generated from the proposed sampling activities (estimated to be less than 20 gallons) will be collected in a 55-gallon drum, labeled, and secured on the Site. All waste material generated will be properly disposed of in accordance with local, state, and federal regulations.

Field Measurements

Field measurements will include use of a PID and/or FID to measure volatile emissions from soils and to monitor concentrations of volatiles in air. Soil samples will also have pH measurements obtained by mixing 50 percent soil and 50 percent water in a beaker and measuring the pH of the solution with litmus paper. For the syringe method, the mass of soil to place in the laboratory-provided VOA is measured by the number of syringe volumes used.

QA/QC

One duplicate soil sample for every ten soil samples collected will be taken for laboratory analysis. The duplicate sample will be given a different identifier for laboratory analytical purposes.

Other QA/QC measures include obtaining equipment blanks (one per day), field blanks (one per day), and travel blanks (one per day) for laboratory analysis. These samples will be immediately placed in a chilled cooler to avoid loss of VOCs. Preservatives will also be used in the VOAs or En Core™ samplers to avoid loss of VOCs.

Housekeeping/Cleanliness

Sampling equipment will be triple rinsed prior to collection of each sample to avoid cross contamination. The equipment will first be cleaned by scrubbing with a mixture of deionized water and non-phosphate detergent. A primary rinse of the equipment will then be conducted. After the primary rinse, the equipment will be given a final clean rinse with deionized water. Disposable equipment, including gloves, will be replaced between sampling locations.

Analytical Methods and Preservation

The analytical methods used for this project are EPA-approved methods. These documents may be reviewed by LFR's QA staff during laboratory audits to verify that project specifications are met. The analytical procedures described below are carried out by the laboratory. Detection limits for these methods are attached to the end of this Appendix.

The following are the analyses that may be conducted during this project:

- California Code of Regulations (CCR) Title 26 Metals using EPA 6010/7000 Series Methods
- total petroleum hydrocarbons (TPH) using EPA Method 8015M

- VOCs using EPA Method 5035/8260B
- PCBs using EPA Method 8082
- pesticides using EPA Method 8081
- dioxins using EPA Method 8290

Internal Standards

Internal standards are measured amounts of method-specified compounds added after preparation or extraction of a sample. Internal standards are added to samples, controls, and blanks in accordance with method requirements to identify column injection losses, purging losses, or viscosity effects.

Acceptance limits for internal standard recoveries are set forth in the applicable method. If the internal standard recovery falls outside of acceptance criteria, the instrument will be checked for malfunction and the sample will be reanalyzed after any problems are resolved.

Method Detection Limits

The Method Detection Limit (MDL) is the minimum concentration of an analyte or compound that can be measured and reported with 99 percent confidence that the concentration is greater than zero. MDLs are established for each method, matrix, and analyte, and for each instrument used to analyze project samples. MDLs are derived using the procedures described in 40 Code of Federal Regulations (CFR) 136, Appendix B (EPA 1990a). The EPA requires that MDLs be established on an annual basis. MDLs must be less than the applicable reporting limits for each target analyte.

To the extent feasible, the MDL will be less than or equal to screening criteria such as the National Ambient Water Quality Criteria and the Maximum Contaminant Levels (MCLs). The analytical reporting limit may vary, depending on sample dilution. Efforts will be made to use the lowest reporting limit as technically feasible.

Laboratory Instrument Calibration

Analytical instruments will be calibrated in accordance with the procedures specified in the applicable method. All analytes that are reported should be present in the initial and continuing calibrations, and these calibrations must meet the acceptance criteria specified in the reference method. Records of standard preparation and instrument calibration will be maintained. Records should unambiguously trace the preparation of standards and their use in calibration and quantitation of sample results. Calibration records will be traceable to standard materials.

At the onset of analysis, instrument calibrations will be checked using all of the analytes of interest. This applies equally to multi-response analytes. At a minimum, calibration criteria will satisfy method requirements. Analyte concentrations can be determined with either calibration curves or response factors, as defined in the method. Guidance provided in SW-846 should be considered to determine appropriate evaluation procedures (EPA 1996).

Mobile-Laboratory Calibration

An initial calibration curve is performed for all target compounds as follows:

- at the start of the project
- when the gas-chromatograph column or operating conditions have changed
- when the daily mid-point calibration check cannot meet the specified requirements

A linearity check of the calibration curve for each compound is performed by computing a correlation coefficient and an average response factor. If a correlation coefficient of 0.99 or a percent relative standard deviation of ±20 percent (±30 percent for vinyl chloride) is obtained, an average response factor is used over the entire calibration range. If the linearity criteria are not obtained, quantitation for that analyte can be performed using a calibration curve.

Continuing calibration standards are analyzed at the beginning of each day. Acceptable continuing calibration agreement is set at ±20 percent to the average response factor from the calibration curve, except for vinyl chloride, which requires a 30 percent agreement. When calibration checks fall outside this acceptable range for analytes detected on the Mandalay Site, the on-site chemist will perform a corrective action consisting of verification of the standard and/or a new calibration curve for the analytes out of specifications. The continuing calibration includes all compounds expected at the Mandalay Site and compounds specified in the RAP.

Evaluation of Tentatively Identified Compounds

No tentatively identified VOCs ("tentatively identified compounds," or TICs) are anticipated to be detected during sample analysis. However, should TICs be reported by the laboratory, depending on the reported concentrations of the TICs identified, LFR will either address TICs in the data evaluation (EPA 1989) or, if a significant number of TICs are identified during the investigation, the use of these data in the data evaluation will be discussed with the regulatory toxicologist for the project, should one be designated.

Quality Objectives and Criteria for Measurement Data

The following sections describe the outputs of the Data Quality Objective (DQO) planning process and the performance or acceptance criteria established for the project data.

Identification of Data Uses and Definition of Project DQOs

Decisions will be made based on data obtained from sampling and analysis programs. Data collected through implementation of this QAPP should satisfy federal, state, and local data quality guidelines. These data may be used to characterize the nature and extent of affected soil gas, soil, surface water, groundwater, and ambient air to support the evaluation of corrective/remedial action, and/or to assist in determining the need for additional actions.

The presence of environmental contaminants will be established by the extent of valid detectable concentrations of the chemicals of potential concern (COPCs). DQOs have been developed to ensure that the data quality meets project objectives.

The work will be conducted and documented so that the data collected are of sufficient quality for their intended use (U.S. EPA 1998). DQOs specify the data type, quality, quantity, and uses needed to make decisions, and are the basis for designing data collection activities. DQOs have been used to design the data collection activities presented in the work orders. The DQOs for the project are discussed below.

The project DQOs developed specifically for the planned sampling and analysis program have been determined based on U.S. EPA's seven-step DQO process (U.S. EPA 1994a). The Project Manager will evaluate the project DQOs to establish if the quantitative and qualitative needs of the sampling and analysis program have been met. The project definition associated with each step of the DQO process can be summarized as follows:

1. State the Problem: Previous investigations indicated that soil gas, soil, and groundwater in the site vicinity have been affected by COPCs. Additional sampling programs should provide additional characterization in addition to subsequent sampling programs to provide confirmation that remediation activities have been completed and remaining soils meet project RAOs.

2. Identify the Decision: The data will be used to evaluate the soil gas, soil, and groundwater, to evaluate risk, and provide confirmation that remedial activities meet project RAOs or to assist in determining the need for other actions to be conducted at the Site.

3. Identify Inputs to the Decision: Inputs to the decision will include results of analytical testing of soil gas, soil, and groundwater samples from selected locations at the project site and the data validation results. Each of these matrices will be tested for the specified analytes as presented in an activity specific field sampling and analysis plans, work plans or monitoring plans.

4. Define the Study Boundaries: The boundaries of the field sampling and analysis program will be the perimeter of the project Site.

5. Develop a Decision Rule: Decisions will be based on laboratory results for the target constituents for each respective matrix tested. If no valid detectable concentrations of target compounds are reported for the given samples, a decision will be made whether or not the Site has been fully characterized/remediated with respect to the compounds tested and no further sampling will be required as part of this assessment. The method reporting limit will be reviewed for each target compound to establish if it is sufficiently low to make an accurate determination. If target compounds are detected above analytical reporting limits, then a decision will be made as to the validity of the analytical results. Other observations will be used in conjunction with analytical results to establish whether sufficient number or location of samples has been collected.

6. Specify Limits on Decision Error: All analytical testing results will be subjected to data validation. Data are considered valid if the specified limits on precision, accuracy, representativeness, comparability, and completeness are achieved. The results of detected target constituents will be considered in evaluating the need for additional sampling of site soil gas, soil, and groundwater.

7. Optimize the Design: Field sampling programs are designed to provide the type and quantity of data needed to satisfy each of the aforementioned objectives. Separate field sampling plans, work plans and monitoring plans provide the specifications for the data collection activities, including the numbers of samples, respective locations, and sampling techniques. The quality of the data will be assessed through the procedures further described in this QAPP.

The quality of the field data, which will be generated using portable instruments that must be calibrated following the procedures described in this QAPP, must be sufficient to allow proper evaluation of the results. The quality of the laboratory data will be such that the data can be evaluated using the process defined in the *Risk Assessment Guidance for Superfund* (EPA 1989) and *Laboratory Data Validation Functional Guidelines* (EPA 1994a and 1994b). Using this process will allow data quality to be evaluated for all of the uses identified above.

1.4.2 Data Acceptance Criteria

The laboratory data generated during the project implementation will be evaluated for precision, accuracy, completeness, comparability, and representativeness. Precision and accuracy are the primary parameters used in evaluating the quality of the data. Data evaluation will be conducted in accordance with the guidance entitled *Laboratory Data Validation Functional Guidelines* (EPA 1994a and 1994b).

Precision and Accuracy

Precision criteria allow evaluation of the reproducibility of measurements under a given set of conditions. They quantitatively measure the variability of a group of measurements. Data precision is measured by calculating relative percent differences (RPDs) of the analytical results for field and laboratory splits.

Analytical precision is a measurement of the variability associated with duplicate or replicate analyses of the same sample in the laboratory, and is determined by analysis of laboratory QC samples, such as duplicate control samples, matrix spike duplicates, or sample duplicates. If the recoveries of analytes in the specified control samples are comparable within established control limits, then precision is within limits.

Total precision is a measurement of the variability associated with the entire sampling and analytical process. It is determined by analysis of duplicate or replicate field samples, and measures variability introduced by both the laboratory and field operations. Field duplicate samples are analyzed to assess field and analytical precision.

Duplicate results are assessed using the RPD between duplicate measurements. If the RPD for laboratory QC samples exceeds established laboratory RPD criteria, data will be qualified as described in the applicable validation procedure. If the RPD between primary and duplicate field samples exceeds 30 percent for groundwater or 100 percent for soil, data will be qualified as described in the applicable validation procedure. The RPD will be calculated as follows:

$$RPD = 100 \times \frac{|X_2 - X_1|}{\frac{X_2 + X_1}{2}}$$

where:

X_1 and X_2 are the two observed values

Accuracy is a statistical measurement of correctness and includes components of random error (variability because of imprecision) and systematic error. It reflects the total error associated with a measurement. A measurement is accurate when the value reported does not differ from the true value or known concentration of the spike or standard.

Accuracy of laboratory analyses will be assessed by laboratory control samples, surrogate standards, matrix spikes, and initial and continuing calibrations of instruments. Laboratory accuracy is expressed as the percent recovery (%R). Accuracy limits are statistically generated by the laboratory or required by specified U.S. EPA methods. If the percent recovery is determined to be outside of acceptance criteria, data will be qualified as described in the applicable validation procedure. The calculation of %R is provided below:

$$\%R = 100 \times \frac{X_s - X}{T}$$

where:

X_S is the measured value of the spiked sample
X is the measured value of the unspiked sample
T is the true value of the spike solution added

Field accuracy will be assessed through the analysis of field equipment and trip blanks. Analysis of blanks will monitor errors associated with the sampling process, field contamination, sample preservation, and sample handling. The DQO for field equipment and trip blanks is that all values are less than the reporting limit for each target constituent. If contamination is reported in the field equipment or trip blanks, data will be qualified as described in the applicable validation procedure.

Because the precision and accuracy of any data obtained will depend on the type of measurement and the type of medium sampled (solid, liquid, or vapor), the data acceptance criteria for precision and accuracy should be site- and measurement-specific. Initially, laboratory data acceptance criteria for precision and accuracy will be based on control limits used by the analytical laboratory.

If deemed necessary, site-specific data acceptance criteria will be developed after sufficient data are collected to perform valid statistical calculations to determine project data-based acceptance criteria. The results of the precision and accuracy evaluation of the initial data will be used to assess the appropriateness of the initial data acceptance criteria. Corrective action to be taken if precision and accuracy data acceptance criteria are not met may include additional sampling and/or reanalysis.

Representativeness

Representativeness is the degree to which data accurately and precisely represent selected characteristics of the media sampled. Representativeness of data collection is addressed by careful preparation of sampling and analysis programs. This QAPP, together with the RAP, addresses representativeness by specifying the numbers and locations of samples; incorporating appropriate sampling methodologies; specifying proper sample collection techniques and decontamination procedures; selecting appropriate laboratory methods to prepare and analyze soil gas, soil, and groundwater; and establishing proper field and laboratory QA/QC procedures.

Comparability

Comparability is an expression of confidence with which one data set can be compared to another. The objective of comparability is to verify that data developed during the investigation are comparable to site knowledge and adequately address applicable criteria or standards established by the U.S. EPA and California Department of Health Services (DHS). This QAPP addresses comparability by specifying laboratory methods that are consistent with the current standards of practice as approved by the U.S. EPA and DHS.

Special Training Requirements/Certification

All project staff working on the site must be health and safety trained and must follow requirements specified in the HSP for the project. The HSP describes the specialized training required for personnel on this project and the documentation and tracking of this training.

Documentation and Records

The most current QAPP will be included in the RAP. Updates and modifications will be incorporated in the QAPP as necessary. The Project QA/QC officer will be responsible for distributing the updates and modification to the analytical laboratory and Project Manager.

Data Reporting Format

Analytical records will include standard operating procedures for sample receipt, preparation, analysis and report generation as well as the actual data reports with all specified supporting information (e.g. run logs, case narratives). The amount of supporting information is determined by data validation needs and the need for the documents to stand alone. Analytical QA/QC issues that should be documented include standard traceability, frequency, and results of QC samples such as method and instrument blanks, spiked samples, replicates, calibration check standards and detection limit studies.

The following information will be supplied by laboratories as data deliverables to support project activities, data validation and the documentation of data quality:

Data Deliverables
Case narrative including a discussion of nonconformance and corrective actions
Sample data and QC data summary forms
COC forms, sample receipt forms, logbook pages, shipping manifests
Verification of sample temperature on receipt
Copies of temperature logs for storage coolers used to store samples
Certificate of cleanliness for all lab-supplied sample bottles
Internal COC
Copies of SOPs
Sample & Standard preparation logs
Instrument Operating Conditions
Copies of sample analysis logbooks and analyst's notes

Data Management Plan

LFR maintains a document management policy that supports project activities by creating and retaining records that document project activities in an accurate and transparent manner that will allow for reviews and data usability assessments. These records will include the following as a minimum:

- LFR will maintain training and certification records, which include enough detail to verify the suitability and relevance of the training and certifications. Training files will contain enough detail to support a demonstration of competency of all personnel performing project-related activities.
- Sample collection records will include sampling procedures, the names of the persons conducting the activity, sample number, sample collection points, maps and diagrams, equipment/method used, climatic conditions, and unusual observations. Bound notebooks, pre-printed forms, or computerized notebooks can serve as the recording media.
- COC records document the progression of samples as they travel from the original sampling location to the laboratory and finally to their disposal or archival. These records should contain the project name, signatures of the sample collector, the lab custodian and other custodians. The records should document any sample anomalies.
- Quality control records will include documentation on field QA/QC issues such as field, trip, and equipment rinsate blanks, collocated and field-spiked samples, and sample preservation.

Office Documentation

Samples will be tracked and data archived at LFR's Costa Mesa office. LFR's QA/QC Officer will be responsible for ensuring that documentation is in order and that all results are obtained for the analyses requested on the COC and that sample identifications on the laboratory reports match those on the COCs. The project file will be used in data tracking and documentation, as discussed below.

The project file is the common location for all information required in data evaluation and report preparation. It contains documents including work plans, sampling plans, assessment reports, correspondence, field activities logbooks, COCs, and sampling information forms. The file is organized for easy retrieval and long-term storage of information (two years or more). The LFR project manager will direct the maintenance of the project file.

Laboratory Custody

The fixed laboratory will designate a sample custodian who will accept custody of the shipped samples and check that the information on the sample labels matches that on the COC. The custodian will then enter the appropriate data into the laboratory's sample tracking system. The custodian will use the sample number on the sample label or will assign a unique laboratory number to each sample. As a record of sample receipt, the analytical laboratory will return a copy of the COC, with the assigned laboratory numbers, to the sampler. The custodian will then transfer the sample(s) to the proper analyst(s) or store the sample(s) under refrigeration until they are analyzed.

The samples designated for field analyses will be handed directly to the on-site chemist immediately after collection. The on-site chemist will document receipt of the sample and prior to analysis. The on-site chemist will maintain analytical records including data and time of analysis, sampler's name, chemist's name, sample identification number, sample depth, concentrations of compounds detected, calibration data, and any unusual conditions.

Both fixed and mobile laboratory personnel are responsible for the care and custody of samples from the time they are received until the sample is exhausted or disposed. Disposal of unused samples must comply with all applicable federal, state, and local environmental regulations. Data sheets and laboratory records will be retained as permanent documentation.

Quality Control

This section presents QC requirements relevant to the analysis of environmental samples that will be followed during all project analytical activities. The purpose of the QC program is to produce data of known quality that satisfy the project objectives and that meet or exceed the requirements of the standard methods of analysis. This program provides a mechanism for ongoing control and evaluation of data quality measurements through the use of QC materials.

The chemical data to be collected for this effort will be used to assess the potential extent of affected media, to assess possible remedial action(s) that may be necessary, or to assist in determining the need for other actions to be conducted at the Site. As such, it is critical that the chemical data be of the highest confidence and quality. Consequently, the following strict QA/QC procedures will be adhered to:

- strict protocols for field sampling and decontamination procedures
- collection and laboratory analysis of appropriate field equipment blanks to monitor for contamination of samples in the field or the laboratory
- collection and laboratory analysis of matrix spike, matrix spike duplicate, and blind split samples to evaluate analytical precision and accuracy
- attainment of completeness goals

Equipment Decontamination

Drilling and sampling equipment used during the site investigation that might come into contact with samples, borings, wells, or chemically affected materials will be properly decontaminated before and after each use at the Site. Decontamination procedures at this Site will include the following:

- Equipment will be cleaned immediately before each use with high-pressure hot water (steam cleaning) and/or washed with a laboratory-grade detergent (Alconox) and rinsed with deionized or distilled water.
- Clean bulky equipment will be stored on plastic sheeting in uncontaminated areas and covered with clean plastic sheeting if not to be used immediately.
- Cleaned small equipment that will not be used immediately will be stored in plastic bags.
- Clean, disposable gloves that do not degrade when exposed to decontamination liquids will be worn while decontaminating sampling equipment and tools.
- Hand augers will be decontaminated with alconox solution and/or steam cleaner between sampling locations.

Standards

Current laboratory standards will be used to calibrate laboratory equipment or to prepare samples and will be certified by National Institute of Standards and Technology, U.S. EPA, or other equivalent source. The expiration date will be established by the manufacturer, or based on chemical stability, the possibility of contamination, and environmental and storage conditions. Standards will be labeled with expiration dates, and will reference primary standard sources if applicable. The laboratory will discard expired standards.

Holding Time Compliance

Sample preparation and analysis will be completed within the required method holding time (Table 1). Holding time begins at the time of sample collection. If holding times are exceeded and the analyses are performed, the associated results will be qualified as described in the applicable validation procedure. The following definitions of extraction and analysis compliance are used to assess holding times:

- preparation or extraction completion: completion of the sample preparation process as described in the applicable method, before any necessary extract cleanup
- analysis completion: completion of all analytical runs, including dilutions, second-column confirmations, and any required re-analyses

Preventive Maintenance

The LFR Field Manager is responsible for documenting the maintenance of all field equipment prescribed by the manufacturer's specifications. Scheduled maintenance will be performed by trained personnel. Procedures specific to the calibration, use, and maintenance of field equipment are presented in the activity specific FSAP or air monitoring plans. The analytical laboratory is responsible for all analytical equipment calibration and maintenance as described in its laboratory QA plan. Subcontractors are responsible for maintenance of all equipment needed to implement subcontracted duties.

Quality Assurance/Quality Control Samples

Field and laboratory QC check samples will be analyzed as required by regulatory agencies and will consist of introducing various control samples into the sample analysis stream, to help evaluate the accuracy and precision of analytical results.

QC Samples – Fixed Laboratory

The following QC samples will be collected by either LFR field personnel or prepared by a state-certified analytical laboratory. All of the blank and field duplicate samples will be analyzed by the specific laboratory.

Laboratory Reagent Blanks

A laboratory reagent blank is deionized, distilled water that is extracted by the laboratory and analyzed as a sample. Analysis of the reagent blank indicates potential sources of contamination from laboratory procedures (e.g., contaminated reagents, improperly cleaned laboratory equipment, or persistent contamination from the presence of certain compounds in ambient laboratory air). A reagent blank will be analyzed at least once each day for each method used by the laboratory for that day. For air analysis, a blank air sampling cartridge will be used.

If the blank contains detectable concentrations of common laboratory contaminants (e.g., acetone, 2-butanone, methylene chloride, and phthalate esters), the field sample results will be considered as positive results only if the concentrations in the field sample exceed 10 times the maximum amount detected in any blank. If the detected concentration of a common laboratory contaminant in a field sample is less than 10 times the concentration detected in the blank, then it will be concluded that the chemical was not detected in the particular sample above a quantitation limit equal to blank concentration.

If all samples contain levels of a common laboratory contaminant that are less than 10 times the level of contamination noted in the blank, then the chemical will be eliminated from use in data evaluation. If the blank contains detectable concentrations of chemicals that are not common laboratory contaminants, then the above considerations apply; however, the sample concentrations are compared to five times the concentration detected in the blank.

Field Equipment Blanks

Blank samples will be analyzed to determine whether contamination has been introduced into a sample set either in the field while the samples were collected or during sample transport to the laboratory, or in the laboratory during sample preparation and analysis. To prevent inclusion of non-site-related contaminants in the data evaluation, the concentrations of the chemicals detected in the blanks will be compared to the concentrations of the same chemicals detected in the site samples. For air analysis, a blank air sampling cartridge will be used.

A field equipment blank is a sample that is prepared in the field by pouring deionized, distilled water into cleaned sampling equipment. The water is then collected and analyzed as a sample. A field equipment blank is typically blind (given a fictitious name so that the laboratory will not recognize it as a blank). The field equipment blank gives an indication of contamination from field procedures (e.g., improperly cleaned sampling equipment or cross contamination). Field equipment blanks will be collected at a minimum frequency of at least one per day, or 5 percent of primary field samples when non-dedicated equipment is used, whichever is less. The field equipment blanks should be analyzed using the same analyses requested for the associated primary samples collected. For air monitoring, blank sampling devices will be analyzed.

If the blank contains detectable concentrations of common laboratory contaminants (e.g., acetone, 2-butanone, methylene chloride, and phthalate esters), the field sample results will be considered as positive results only if the concentrations in the field sample exceed 10 times the maximum amount detected in any blank. If the detected concentration of a common laboratory contaminant in a field sample is less than 10 times the concentration detected in the blank, then it will be concluded that the chemical was not detected in the particular sample above a quantitation limit equal to blank concentration.

If all samples contain levels of a common laboratory contaminant that are less than 10 times the level of contamination noted in the blank, then the chemical will be eliminated from use in data evaluation. If the blank contains detectable concentrations of chemicals that are not common laboratory contaminants, then the above considerations apply; however, the sample concentrations are compared to five times the concentration detected in the blank.

Trip Blanks

The primary purpose of trip blanks is to detect potential additional sources of contamination that could influence contaminant values reported in field samples, both quantitatively and qualitatively. Trip blanks serve as a mechanism of control for sample bottle preparation, blank water quality, and sample handling. Trip blanks are submitted to the laboratory with water samples collected for analysis of VOCs; for air analysis, a blank air sampling cartridge will be used.

When a trip blank is identified as contaminated, the appropriate validation flag, as described in the applicable validation procedure will be applied to associated sample results. Other issues affecting the use and integrity of trip blanks include the following:

- Handling: Trip blanks may be held on site for a maximum of one week. The temperature of the trip blanks during storage will be maintained at 4 degrees Celsius. Expired trip blanks will be returned to the laboratory for disposal.
- Holding Time: The holding time for analysis of trip blanks begins at the time the oldest sample in the set is collected.

Matrix Spike Samples

Matrix spikes are performed by the analytical laboratory to evaluate the efficiency of the sample extraction and analysis procedures, and are necessary because matrix interference (that is, interference from the sample matrix, water, or soil) may have a widely varying effect on the accuracy and precision of the extraction analysis. The matrix spike is prepared by the addition of known quantities of target compounds to a sample. The sample is extracted and analyzed, the results of the analysis are compared with the known additions, and a matrix spike recovery is calculated, giving an evaluation of the accuracy of the extraction and analysis procedures.

Matrix spike recoveries are reviewed to check that they are within an acceptable range. However, acceptable ranges vary widely with both sample matrix and analytical method. Matrix spikes and matrix spike duplicates will be analyzed by the laboratory at a frequency of at least one per 20, or 5 percent of the primary field samples. Typically, matrix spikes are performed in duplicate to evaluate the precision of the procedures as well as the accuracy. Precision objectives (represented by agreement between matrix spike and matrix spike duplicate recoveries) and accuracy objectives (represented by matrix spike recovery results) are based on statistically generated limits established annually by the analytical laboratory. It is important to note that these objectives are to be viewed as goals, not as criteria. If matrix bias is suspected, the laboratory will reanalyze the sample or the associated data will be qualified and the direction of the bias indicated in the data validation report. The laboratory will provide matrix spike and matrix spike duplicate acceptance criteria.

Surrogate Standard

Surrogates are added to each soil and aqueous sample for organic analysis. Sample analyses using surrogate analytes are shown in Table 4. The results of surrogate standard determinations are compared with the true values spiked into the sample matrix before extraction and analysis, and the percent recoveries of the surrogates are calculated. If these recoveries fall outside control limits, the associated data may be affected. If a surrogate recovery is not within the recovery criteria range, then the laboratory will reanalyze the sample the appropriate validation flag, as described in the applicable validation procedure (Section 2.8), will be applied to the associated sample result. The laboratory will provide surrogate recovery acceptance criteria.

Laboratory Control Samples

Laboratory control samples analyzed by the laboratory following U.S. EPA method protocols are compared with true values and acceptable ranges as indicators of error and provide for implementation of corrective action. Sample analyses using laboratory control samples are shown in Table 4. If a laboratory control recovery is not within the recovery criteria range, then the laboratory will reanalyze the sample or the appropriate validation flag, as described in the applicable validation procedure (Section 2.8), will be applied to the associated sample result. The laboratory will provide laboratory control sample recovery acceptance criteria.

Field Duplicate and Co-Located Samples

Field duplicates will be collected and analyzed in the same manner as the primary samples. They will be collected at a frequency of 10 percent of the total. Agreement between duplicate sample results will indicate good sampling and analytical precision. The specific location for collection of field duplicate samples will be designated before field activities begin. The precision goal for field duplicate analyses will be plus or minus 30 RPD for aqueous samples and plus or minus 50 RPD for co-located soil samples, as specified in the National Functional Guidelines (U.S. EPA 1994b, 1994c). RPDs only will be calculated for those sample duplications with concentrations with 10 times the method detection limit.

Laboratory Duplicates

Laboratory duplicates are performed on water quality criteria samples (e.g., pH, hardness). They assess both precision and accuracy for the water quality parameters. Laboratory duplicate samples will be prepared and analyzed by the laboratory following U.S. EPA Method protocols. The precision goal for the laboratory duplicate will be ± 20 RPD.

QC Samples - Mobile Laboratory

The following QC samples will be collected during soil-vapor sampling for analysis at the on-site mobile laboratory.

Method Blanks

Method blanks will be run at the start of each day of sampling. Additional blanks will be run as deemed appropriate by the mobile laboratory's chemist in coordination with the Project QA Manager, depending upon concentrations detected. Should a blank analysis indicate a measurable amount of any hazardous substance, the mobile laboratories on-site chemist will investigate and determine the source and resolve the contamination problem before analyzing any additional samples.

Duplicate Samples

Field samples will be collected for soil-gas samples with a frequency of one per 10 samples or more frequently when inconsistent data or observed by the mobile laboratory's chemist. The syringe containing the duplicate soil-gas sample will be temporarily stored in the mobile laboratory at room temperature until the original soil-gas sample has been analyzed. Duplicate samples will not be temporarily stored for the more than 30 minutes in a syringe.

Equipment Maintenance and Calibration

Field personnel will follow the protocols described below to ensure that equipment is in good working condition and that field measurements made by different individuals or at different times are consistent and reproducible.

Maintenance

Equipment operation will be routinely checked and maintained to minimize breakdowns in the field, and non-functional equipment will be removed from service.

Field Calibration Procedures

Calibration of field instruments is necessary to ensure that they are operating correctly and are adjusted so that they yield accurate measurements. Calibration of field instruments will be conducted at least once per day and prior to the first use. All adjustments made to field equipment are recorded in each instrument-dedicated logbook that is kept with the instrument.

Organic Vapor Meter

Field measurements may be collected using portable organic vapor meters that feature hydrocarbon detection by photoionization (e.g., Mini-RAE 2000 PID). The PID is used to measure organic gases and vapors in soil gas as well as in ambient air.

With the PID, manufacturer-supplied calibration standard span gas will be used to calibrate the meter. Calibration of the PID will be performed before each day's sampling activities begin and as needed throughout the day if irregularities in the readings become apparent.

LFR will maintain a logbook containing calibration data for each PID, including time and date of the previous calibration, who performed the calibration, and how it was performed.

Dust Meter

Field measurements may be collected using portable real time aerosol meter (Mini-RAM) that measures aerosols. The Mini-RAM is used to measure dust particulates in ambient air.

The Mini-RAM will be calibrated to manufacturer's specification including daily zero in zero bag before each day's sampling activities begin and as needed throughout the day if irregularities in the readings become apparent.

LFR will maintain a logbook containing calibration data for each RAM, including time and date of the previous calibration, who performed the calibration, and how it was performed.

Supplies and Consumables

Supplies will be checked before they are used in the field or laboratory. The descriptions for sample collection and analysis are presented in the activity specific sampling plans and will be used as a guideline for establishing the acceptance criteria for supplies. A current inventory and appropriate storage system for these materials will verify their integrity before use. Efficiency and purity of supplies will be monitored through the use of standards and blank samples.

Data Reduction and Validation

One hundred percent of the data generated as part of this investigation will be validated in accordance with Level III data validation techniques as presented in the "Contract Laboratory Program National Functional Guidelines for Organic and Inorganic Data Review" ("National Functional Guidelines"; U.S. EPA 1994b and 1994c). Data validation will be performed and documented by LFR in a manner consistent with the National Functional Guidelines. The results of the data validation will be included in a Data Validation Memorandum. This documentation will be maintained by LFR in the project files.

Procedures for Data Validation

Data validation criteria are derived from the National Functional Guidelines. The guidelines provide specific data validation criteria that can be applied to data generated for this investigation.

For the Level III data validation, the laboratory data will be reviewed for compliance with the applicable method and the quality of the data reported. The following summarizes the areas of data validation:

- narrative, cross-reference, COC, and method references
- analytical results
- surrogate recoveries (as applicable)
- blank results
- laboratory control sample recoveries
- duplicate sample results or duplicate spike recoveries
- sample spike recoveries (as applicable)
- acceptance criteria for applicable QC samples
- data completeness
- holding times
- compound identification and quantification

The application of data validation criteria is a function of project-specific DQOs. The laboratory QA/QC manager will determine if the DQOs for the analytical data have been met. Results of the data validation review will be documented and summarized in a Data Validation Memorandum, which is reported along with the associated data.

In addition, each data validation will include a comprehensive review of the following QA/QC parameters as indicated in the National Functional Guidelines:

- holding times (to assess potential for degradation that will affect accuracy)
- gas chromatograph/mass spectrometer system (GC/MS) instrument check (to assess accuracy and sensitivity of method)
- initial calibration (to assess method sensitivity)
- continuing calibration (to assess method sensitivity)
- blanks (to assess contamination for all compounds)
- System Monitoring Compounds (to assess method accuracy)
- Matrix Spikes/Matrix Spike Duplicates or Laboratory Fortified Blanks (to assess accuracy of the methods and precision of the method relative to the specific sample matrix)
- Internal Standards (to assess method accuracy and sensitivity)
- Target Compound Identification
- Compound Quantitation Limits and Method Detection Limits (to assess sensitivity as compared to project-specific requirements)

- TICs
- System Performance (to assess accuracy and precision)
- Field Duplicate RPDs (to assess precision of the method relative to field sampling techniques, the specific sample matrix, and representativeness of the sample aliquot to the area sampled)

Spike recoveries for laboratory control samples, matrix spike samples, and surrogates will be evaluated against laboratory specific acceptance criteria. In addition, the RPDs for the laboratory control and matrix spike duplicates will be evaluated against laboratory specific acceptance criteria. Laboratories will provide the acceptance criteria for each analytical method on each sample delivery group. Data will be qualified as appropriate for non-compliance with the acceptance criteria. Table 4 presents a summary of this analysis.

Data Qualifiers

The data validation procedures were designed to review each data set and identify biases inherent to the data set and determine its usefulness. Data validation flags are applied to those sample results that fall outside of specified tolerance limits and, therefore, did not meet the program's QA objectives. Data validation flags to be used for this project are defined in the National Functional Guidelines. Data validation flags will indicate whether results are considered anomalous, estimated, or rejected. Only rejected data are considered unusable for decision-making purposes; however, other qualified data may require further verification.

PERFORMANCE AND SYSTEM AUDITS

Audit programs are established and directed by the LFR QA staff to verify that field and laboratory activities are performed in compliance with project controlling documents. This section describes responsibilities, requirements, and methods for scheduling, conducting, and documenting audits of field and laboratory activities.

Field Audits

Field audits focus on appropriateness of personnel assignments and expertise, availability of field equipment, adherence to project controlling documents for sample collection and identification, sample handling and transport, use of QA samples, COC procedures, equipment decontamination, and documentation. Field audits are not required, but may be performed in the event that significant discrepancies are identified that warrant evaluation of field practices.

Laboratory Audits

Laboratory audits include reviews of sample handling procedures, internal sample tracking, standard operating procedures, analytical data documentation, QA/QC protocols, and data reporting. Any selected mobile or off-site (stationary) laboratory will be licensed by the State of California as a certified testing laboratory, and will participate in the Water Pollution and Water Supply Performance Program for hazardous waste, wastewater, and drinking water analyses.

QAPP MODIFICATIONS

Changes to procedures described in this QAPP will be reported as an addendum this QAPP. The addendum will be distributed to project and laboratory personnel as appropriate.